

Accelerator Systems Division Highlights for the Week Ending March 28, 2003

ASD/LANL: Warm Linac

HIGH-POWER RF (WBS 1.4.1.1)

Accomplishments This Week: (1) We shipped the following tested components to ORNL: two CPI SCL klystrons with magnet assemblies, one DTL klystron with socket, one DTL window, and one DTL load. (2) We started conditioning and site acceptance testing another DTL klystron and two DTL windows on the LANL RF test stand. (3) We performed site acceptance tests of two CPI SCL klystrons. (4) Titan Pulsed Power began factory acceptance testing of the second SCL RF transmitter. First unit is fully tested, but we delayed its shipping until next week, after success demonstrated of improved controls software on the second unit.

Concerns & Actions: The 5 MW RF system continues to be our biggest concern. Testing remains suspended pending repairs of broken circulator, loads, and sliding short. The circulator vendor (AFT) is modeling the performance of the kapton window, where we are experiencing arcing at 5 MW. They delayed their trip to LANL one week (to week of Apr. 7) pending conclusion of the modeling. The Thales factory retest of the 5 MW klystron with their modified transition waveguide has been delayed two more weeks, until May 12. The klystron is our critical path item, with forecast of the first unit delivery to ORNL not before July 31. This represents at least a 2-month delay relative to the current early finish IPS milestone CCLFB90 ("install first CCL RF System at ORNL"). Forecast delivery of the last CCL RF system continues to support early start of CCL commissioning (IPS milestone CCL240) on 5/17/04, because 3 Thales tubes are built and ready for acceptance tests, pending resolution of the output transition arcing problem.

HIGH-VOLTAGE POWER CONDITIONING (WBS 1.4.1.2)

Accomplishments: (1) Prototype HV converter-modulator (HVCM) operation supported klystron testing at Los Alamos. Unit ran without failure. (2) Dynapower production HVCM S/N 4 arrived at LANL and it is being installed in our RF test lab.

Concerns & Actions: Pete Trujillo traveled to ORNL to repair the incorrectly wound production HVCM transformers that were reported last week.

DRIFT-TUBE LINAC (WBS 1.4.2)

Accomplishments: (1) Repaired Tank-3 waveguide iris (#3A) is in final form (brazing repair and machining went well) and has passed two He leak checks. It will be shipped over the weekend to ORNL. (2) All 16 Tank-3 post couplers passed final leak check and flow tests. They will be shipped to ORNL over the weekend. (3) The last two T-3 drift tubes are now leak tight and are undergoing stem straightening and machining of fiducial features; we hope to get stems into plating on Saturday, and forecast shipping to ORNL on 4/3/03. (4) Larry Rowton traveled to ORNL to support T-3 vacuum testing in the SNS tunnel. (5) Approximately 25 T-1 drift tubes have one face at final profile form and another 22 are rough machined. Orbital welding should start next week. (6) 27 T-1 top hats are back from plating and are ready for deburring and final machining. (7) The T-1 waveguide iris has its final brazing successfully completed and was returned to CMI for final machining. (8) The first batch of 21 diverters for Tank-4 had their first brazing (copper sleeve to diverter). (9) Weld development and qualification for tank four water channel e-beam welds are underway at Hanford. (10) T-4 drift tube body water channel weld "preps" are being machined. (11) T-5 and 6 drift tube bodies are being rough machined. (12) The procurement package for drift tube prototype for qualification of a second machining vendor was submitted to procurement.

Concerns & Actions: (1) As noted above, the T-3 RF drive iris is being shipped 11 days earlier than our last forecast. This item is no longer on the DTL critical path. (2) Our DTL critical path item is now the last two drift tubes. We are in continuous contact with ORNL to support other activities (e.g., tuning and installation of post couplers, drive iris, pumps) occurring in the interim while we prepare the two drift tubes for shipment next week. (3) The T-1 machining delays reported last week were stopped.

COUPLED-CAVITY LINAC (WBS 1.4.4)

Accomplishment: (1) LANL and ASD staff are now scheduled to travel to ACCEL on 4/6/03. Objectives include: (a) establishing the process for mechanical measurement and mapping of the segments and couplers; (b) establishing the procedure and training of personnel in the start of segment final tuning (dimpling process); (c) reviewing the current status of manufacturing; (d) planning for module assembly including setting up the alignment monuments and fiducials in the assembly bay; (e) reviewing and clearing outstanding ECO's and NCR action items; (f) reviewing the mid-term production schedule and module assembly plans and schedule. (2) Accel received the LANL

water flow test unit; it was assembled and the first testing of segment flow and pressure drops was accomplished. We are evaluating the preliminary results and working to formalize the format for archiving the data.

ASD/JLAB: Cold Linac

Preliminary Q_0 vs E_{acc} curves for cavities 2 and 3 in the first production module are shown below. Cavity 1 is under test. Assembly of the M-2 and M-3 modules continues.

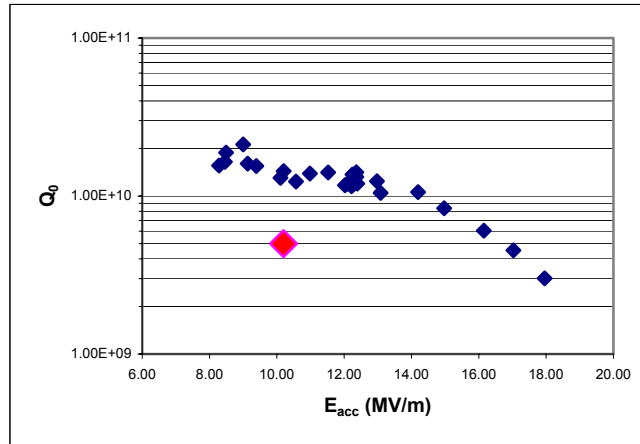


Figure 1. Module M-1, Cavity #2

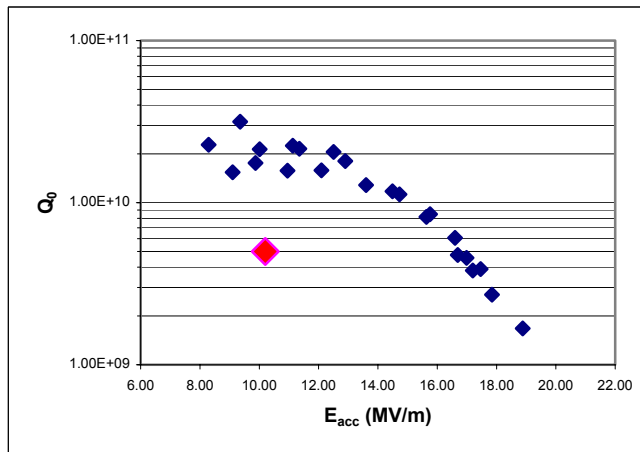


Figure 2. Module M-1, Cavity #3

The helium vessel is being welded on the first production high- β cavity. Post-purification of the first batch of high- β end groups is complete.

Another successful electropolishing run on an old 700 MHz, 3-cell cavity confirmed an etch rate of $0.5 \mu\text{m}/\text{min}$ and demonstrated acceptable uniformity of etching over the surface of the cavity.

ASD/BNL: Ring

A design review of the BNL/SNS Diagnostics Systems was conducted at BNL on March 26 and 27. The review was held via videoconference by Tom Shea, Peter Cameron and the SNS Diagnostics Team.

Bids are being evaluated for the Injection Chicane #1 magnet.

Bids were received for the external shielding for the two HEBT collimators. Bids are under review.

BNL engineers traveled to NETC to inspect production components and address several technical issues. The magnets include Chicane #2 and #3, 36CDM30, 27CD30 and the Injection Dump Septum magnet. Vendor's progress and deliveries are on track.

27CD30: the first article corrector has been assembled and passed final inspection at NETC. They plan to ship it to BNL on April 4th. After BNL acceptance, all production units (19) will be shipped directly to SNS/OR.

Our vendor, BINP, will ship 5 large aperture quads to us on April 10th. We expect them at BNL by mid May.

Ring half-cells: work continues on half-cells #5, 6 and 7.

36CDM30 (NETC): Acceptance testing of the repaired unit is underway.

21CO26: magnetic measurements are underway. The 1st article production magnet has been fully measured; measurement of unit #2 is in progress.

26Q40: baseline measurements are underway on this 1st article magnet.

41CDM 30: the production first article has been inspected and is ready for acceptance testing. Alpha plans to ship two more magnets next week.

HEBT quads: twelve more quad chambers will be shipped to SNS/OR next Monday.

Ground breaks: R. Lambiase and H. Hseuh are working with the Project Office to sort through ground break locations in the HEBT and RTBT lines.

RF Tune PS: A rep from Danfysik was at BNL this week. Testing of the RF Tune PS was completed and the unit approved for production. The remaining production units (3) will be shipped directly to SNS/OR.

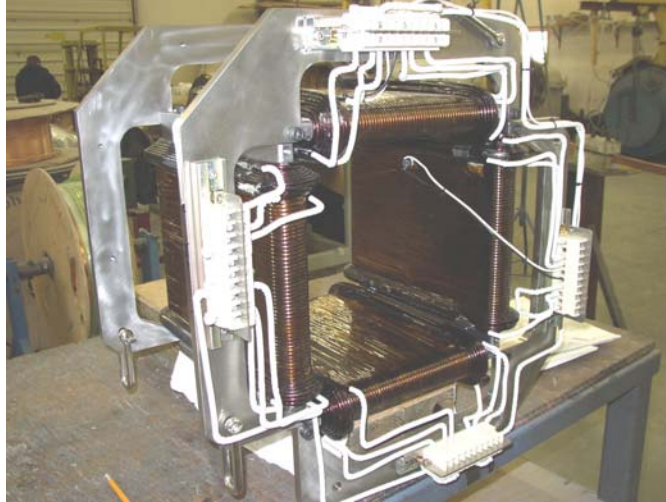
M. Hechler and P. Holik will visit BNL next week to review Installation plans and schedule.

Ring RF: Alex Zaltsman will visit ASD during the next two weeks to address equipment delivery and hand-off (cavities and PAs).

Graeme Murdoch will visit our vendor, Tesla, next week to review production progress on Ph. II of our contract (21Q40 Ring quadrupoles).



Chicane



27CD30

Controls

The Estimate to Completion files for WBS 1.9 were corrected and sent to the Project Office.

Considerable effort was spent on documentation for systems that will be installed shortly. This included a Functional System Document (FSD) for DTL1 and the D-Plats Power Supplies (drafted and reviewed) and for the Beam Loss Monitors (drafted.) In preparation for having IOC's and racks fabricated at the "rack factory", IOC configuration documentation was prepared for all HEBT, Ring, and RTBT PS IOC's. Similar documentation is being prepared for BLM IOC's to be installed for the DTL run, and all other HEBT, Ring, and RTBT controls IOC's. Installation design packages for cabling to accommodate recent changes and additions, including communications and MPS cables to the temporary D-Plate emittance IOC and communications cabling for the additional LLRF IOC's (i.e. the "Doolittle boxes") are also being generated.

The MPS Trigger Generator printed circuit board is complete and waiting on a PO to get 5 boards made. After testing, this will replace the prototype unit now installed, and provide spares for the site and development system. The MPS database template file are now extracted from an excel spreadsheet. Some hand editing is required but this method is much faster to generate files and is less error prone. The power supply controls and MPS inputs for the MEBT quads that were moved in the front end are complete. Testing of the system will happen next week when the AC/DC wiring on the magnets is complete.

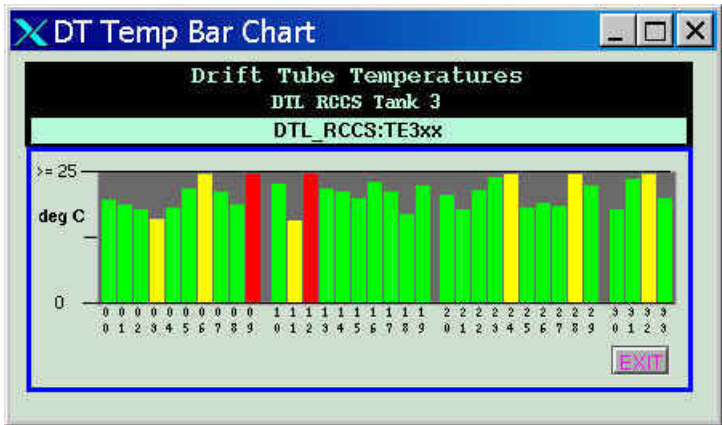
The backup timing system is ready to be moved, but will remain at 701 Scarboro until Eric Bjorklund returns to Los Alamos (April 4.)

Using available fibers, the SNS timing system is now distributed around the BNL campus to support development efforts in diagnostic and RF labs in remote buildings.

Controls supported the MEBT power supply move by generating a diagram for the controls wiring in the new rack; generating a cabling diagram and assembling and installing a new "bathtub" unit that holds the G3 interface modules for the new rack. Work remaining includes termination of the field cabling (by electricians), to occur next Monday.

Controls is supporting the upcoming EMI testing by fabricating twinax couplers to "break" the shield on one end of our long event link and RTDL cables.

Testing of DTL1 and DTL3 RCCS and vacuum systems continued. Some screens for the drift tube thermocouple system are shown below.



DT Temperatures

Drift Tube Temperatures
DTL RCCS Tank 3
DTL_RCCS:TE3xx

RF Temperature Shutdown Interlock
Setpoint 28.0 Status TRIP

| Device | Temp. deg C | Alarms Low SP | Alarms High SP |
|--------|-------------|---------------|----------------|
| TE300 | 20.0 | 17.0 | 25.0 |
| TE301 | 18.0 | 17.0 | 25.0 |
| TE302 | 18.0 | 17.0 | 25.0 |
| TE303 | 16.3 | 17.0 | 25.0 |
| TE304 | 18.0 | 17.0 | 25.0 |
| TE305 | 22.0 | 17.0 | 25.0 |
| TE306 | 27.0 | 17.0 | 25.0 |
| TE307 | 21.0 | 17.0 | 25.0 |
| TE308 | 18.0 | 17.0 | 25.0 |
| TE309 | 23.0 | 17.0 | 25.0 |
| TE310 | 23.0 | 17.0 | 25.0 |
| TE311 | 16.0 | 17.0 | 25.0 |
| TE312 | 25.0 | 17.0 | 25.0 |
| TE313 | 22.0 | 17.0 | 25.0 |
| TE314 | 21.0 | 17.0 | 25.0 |
| TE315 | 21.0 | 17.0 | 25.0 |
| TE316 | 22.0 | 17.0 | 25.0 |
| TE317 | 21.0 | 17.0 | 25.0 |
| TE318 | 18.0 | 17.0 | 25.0 |
| TE319 | 22.0 | 17.0 | 25.0 |
| TE320 | 27.0 | 17.0 | 25.0 |
| TE321 | 26.0 | 17.0 | 25.0 |
| TE322 | 25.0 | 17.0 | 25.0 |
| TE323 | 24.0 | 17.0 | 25.0 |
| TE324 | 27.5 | 17.0 | 25.0 |
| TE325 | 18.0 | 17.0 | 25.0 |
| TE326 | 22.0 | 17.0 | 25.0 |
| TE327 | 18.0 | 17.0 | 25.0 |
| TE328 | 27.1 | 17.0 | 25.0 |
| TE329 | 22.0 | 17.0 | 25.0 |
| TE330 | 16.0 | 17.0 | 25.0 |
| TE331 | 21.0 | 17.0 | 25.0 |
| TE332 | 27.0 | 17.0 | 25.0 |
| TE333 | 22.0 | 17.0 | 25.0 |

EXIT

Status - Drift Tube Temperatures

Drift Tube Temperatures
DTL RCCS

| Alarms | 1 | 2 | 3 | 4 | 5 | 6 |
|--------|-------|-------|-------|-------|-------|-------|
| Status | ALARM | ALARM | ALARM | ALARM | ALARM | ALARM |

Highest Temperatures

| TE | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|----|----|------|----|----|----|
| Temp degC | 22 | 22 | 29.0 | 22 | 22 | 22 |

Temperature RF Shutdown Interlock

| Temp. SP | 1 | 2 | 3 | 4 | 5 | 6 |
|----------|------|------|------|------|------|------|
| Status | TRIP | TRIP | TRIP | TRIP | TRIP | TRIP |

Combined RF Shutdown Interlock

| Status | RCCS:IOC1:W3 | RCCS:IOC2:W3 | RCCS:IOC3:W3 | RCCS:IOC4:W3 | RCCS:IOC5:W3 | RCCS:IOC6:W3 |
|--------|--------------|--------------|--------------|--------------|--------------|--------------|
| Status | OK | OK | OK | OK | OK | OK |

Temperature and Alarm Screens

| Ts/Alms; Tab | DTL1 Ts-Tab | DTL2 Ts-Tab | DTL3 Ts-Tab | DTL4 Ts-Tab | DTL5 Ts-Tab | DTL6 Ts-Tab |
|--------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Ts; Bar | DTL1 Ts-Bar | DTL2 Ts-Bar | DTL3 Ts-Bar | DTL4 Ts-Bar | DTL5 Ts-Bar | DTL6 Ts-Bar |

EXIT

Certified for construction drawings were issued for the installation of the cryogenic control system cables for the Central Helium Liquefier building gas management, purifier, and guard vacuum systems.

The prototype field junction boxes for connection of the medium beta cryomodule signals to the ICS were received from the vendor (DCS) and connected to the prototype cryomodule in the RATS facility. The junction box for the low level signals (silicon diode cryogenic temperature sensors and thermocouples) is located under the center of the cryomodule. The junction box for the medium level signals (cavity and window heaters, stepper motors, pressure transmitters, liquid helium levels, and valves) is located under the return end can. The cables on the prototype junction boxes have extra length to facilitate determining the best routing of each cable. When that routing is determined, the cable lengths will be adjusted and updated drawings provided to the vendor. DCS will then produce the remaining junction boxes once all the mating connectors have been received.



Temperature Junction Box under center of cryomodule

The Cryogenic Control System Cryomodule cable will be routed behind the cryomodule. In the tunnel, a cable tray will be placed on the floor behind the cryomodule to provide protection for the cables.



Installation

Craft Snapshot 3/19/03

| | |
|-----------------------|------|
| ASD craft workers | 69.0 |
| Foremen, ES&H, etc | 9.0 |
| Less WBS 1.9 controls | 4.0 |
| Less absent | 1.0 |
| TOTAL | 73.0 |

Additional DB crafts (electricians) were added in anticipation of HEBT Building Pre beginning next week. BOD of the HEBT Svc Building was taken as planned on 28MAR03.

Good progress continued on preparation for DTL#3 conditioning. The last two drift tubes are expected from LANL next Friday 04APR03. With the receipt of these two drift tubes, the last four DTL#3 drift tubes will be installed next weekend.

DTL#3 post couplers and iris waveguide are expected from LANL on 31MAR03.

A new schedule for HVCM component deliveries was received from Dynapower. Starting 16APR03 one HVCM is schedule to be delivered approximately every ten (10) days.

The HB wave-guide delivery scheduled for 20MAR03 is expected next week.

Transformers for HVCM_CM1 to support DTL#1 are scheduled to be received next week also.

Accelerator Physics

Operations Group

ARR Preparation

- Conduct of Operations – Complete- on the web
- Revising and approving OPM sections needed for the ARR and listed in the COO
- Updating Emergency Procedures
- Migration of Review documentation data to ProjectWise

Working on DTL Tanks 1, 3

- Shielding
- RF Safety
- Controls

Interviewing Operator candidates

ASD Maintenance Plan

- Had the first Maintenance Coordinators, meeting Friday after installation meeting. CF Trailers these will continue.
- DataStream 7i is installed, configuration people coming next week
- New search function in the ETS. – Search by group
- Documentation, manuals travelers etc are to be submitted to the DCC with a barcode sticker on it. We are being audited.

Training

- All operators are required to take the RGD Custodian training
- Revisiting the training interval for some Go-Train courses

HPRF

Request from Don Rej on risk of not testing components

Ion Source Group

AC wiring for the hot spare stand in the front-end building is coming close to completion.

Redesigned alumina insulators with sockets have been ordered for LEBT lens 2. After fabrication, ISI will braze 4-40 Kovar studs into the sockets. This should significantly increase the temperature limit of lens 2.

Survey and Alignment Group

Completed 1st Epoch of Ring floor elevations

The SNS performed an as built of the Target's Group Outer Target Cart Liner. We are in the process of analyzing the data and compare as built with print specifications.

Began construction of a localized network for the positioning of equipment into the HEBT Support Building

Began limited measuring campaign to verify elevations of the Klystron Floor

A crew of SNS Alignment personnel will be traveling to Germany to assist in the alignment of the first CCL module. Before the trip, considerable preparation is required. We are currently interpreting the documents and drawings and assembling them into a usable format so as to minimize document and drawing interpretations on site.

We received the new rods for the vector bars (used to align drift tubes in the drift tube tanks) and will be testing these. We received good results from our last tests so we are increasing the lengths of the rods and see how they will perform.

Fiducialized 2 DTL-3 magnets.

Completed fiducialization of 12Q45 Quadrupole Magnets

Mechanical Group

Cabling and terminations for the RCCS and vacuum system for DTL-3 were completed this week. Functional checkout of these systems will begin next week.

Leak testing of the 29 drift tubes installed in DTL-3 has begun and should be complete early next week.

The first half of the DTL-3 downstream shield wall was completed this week. Construction of the second half of this wall will begin next week.

Magnet Task

We now have 26 12Q45's measured with seven more to go.

We are installing the last vacuum chamber into a HEBT dipole.

After the #2 CCL Quad was returned from the vendor we started measurements on it. It is connected incorrectly, which makes it an Octupole instead of a Quadrupole. It has been returned to the vendor.

Efforts are underway to get the SRF Quad vendor up to speed concerning impregnating coils.

HPRF

LLRF

ORNL

DTL Installation

The LBNL RF control chassis for DTL3 was installed at the site this week. All of the rack components for DTL3 have been installed. The system will be checked out over the next few weeks. The RF control chassis for DTL1 is due April 18.

Reference System

Installation of the reference system continues with emphasis on completing the cabling needed for DTL1&3. The 402.5 MHz reference amplifier chassis is complete and ready for installation. The downconversion/distribution chassis for DTL1&3 were completed this week and are ready for installation.

FPGA Code Development

Craig Swanson spent the week at Los Alamos working with the LANL team on the checkout of the prototype DFE and the preparation of the VHDL code targeted for the DFE.

JLAB Test

Hengjie Ma and Mark Champion will carry out a 2nd round of tests at JLab March 31 through April 02. We plan to perform system characterization measurements, investigate the interaction between the piezo tuner and the RF control system, and attempt to perform pulsed Qo measurements using the SNS RF control system instead of the JLab VCO.

RFQ System Characterization

We began low power (<100 W) testing of the RFQ LLRF control system this week. We operated the system at a fixed amplitude and phase for ~5 hours on Friday. A strip chart recording over this period did not reveal any discernable drift from the set point. This measurement was performed under quiet conditions, i.e., no operating converter modulators and minimal craft workers in the area. We will continue this work as time permits prior to the next commissioning period.

Miscellaneous

Mark Crofford officially joins the ORNL team on March 31. Mark was formerly a LANL employee on change-of-station to ORNL. Three professors from the UT Electrical & Computer Engineering Dept. visited the site this week and continued discussion with Mark Champion about involving UT graduate students in the SNS LLRF control system effort.

LANL

1. Hardware Platform

Work continues on producing the "Rev 0" of the new hardware platform for the LLRF system. We are still on course to have a system ready for test with the DTL at ORNL in mid June.

a. Analog Front End (AFE): Testing is ongoing on the LLRF AFE. The root cause of the poor channel-to-channel isolation on the C and D channels was found to be primarily due to insufficient bypassing of the 10-V power distribution buss within the PCB. Adding four additional low-inductance bypass capacitors brought the isolation up to over 90 dB on the 50 MHz C and D channels. The 805 MHz A and B channels have over 70 dB of isolation. Isolation between either A and B to either C or D is also over 90 dB. No significant discrepancies between the actual AFE performance and the specifications have been observed at this time.

Testing of the BPM diagnostics clock multiplier/DFE combination and the LLRF AFE is in progress. The BPM and LLRF clock circuits and ADC circuits are essentially identical. Some tweaking of the PLL loop parameters has brought the observed broadband measurement jitter down from about 0.5 degrees RMS (about 2 degrees peak-to-peak) to a bit better than 0.3 degrees RMS (about 1.2 degrees peak-to-peak) as measured over a 2 ms acquisition. Macropulse-to-macropulse repeatability has not been measured yet, though I expect it to be similar. By any

definition I believe this exceeds the LLRF requirement on phase jitter. Though this data is technically for the BPM system, it is expected that the LLRF system will behave the same.

Amplitude measurements are presently observed in the 55-64 dB range on the previously described set-up. This barely if at all meets the system specification of 60 dB and needs further study. These measurements are all worst case broadband numbers and do not take advantage of any filtering. Keep in mind that this is a 40 MHz data stream with about a 10-MHz bandwidth.

Following is the message we sent to Bergoz, the manufacturer of the AFE:

"The AFE you have designed is a very nice piece of work despite a few details. As a first article it is amazingly close to meeting our needs. We believe we could use it as-is for the final SNS system just by adding the additional bypass caps. We will probably ask for a few minor changes before freezing the design, though."

b. Digital Front End (DFE): The DFE testing is in progress and we are in the process of loading the first VHDL test code onto the FPGA chip on the board.

c. RF Output (RFO): The board was received on 3/27/03 as expected. It is fully assembled, minus a few components that we are expecting next week. Some rudimentary testing could start next week.

d. Motherboard: The design has been released to fabrication and components have been ordered (60% in house). Incorporating the review comments delayed the final date by about one week and the completed prototypes are expected on April 18.

e. DFE Test Board: This is a simpler version of the DFE To help with testing the AFE and the RFO boards. We have received the printed circuit boards and the assembled units are still expected by 4/4/03.

2. Testing

Work continues on developing test plans: have almost completed RFO and the motherboard. We are also developing a test matrix to cover every VHDL module.LBNL

We initiated the procurement of all long lead items for the remaining chassis needed to run the DTL. We ordered both 50 MHz and 402.5 MHz filters, as well as all the connectorized components from Mini-Circuits. The long lead is in the RLC filters that took over 16 weeks in the fall when we were building the systems for the RFQ and JLAB test. The promised delivery is their 'standard' 10-12 weeks. This order could potentially get delayed by the ongoing restructuring of the credit card ordering system at LBNL. We will be monitoring this closely to ensure we will meet delivery schedule for the DTL2 and 3-6 systems.

We also completed all front panels for the chassis. The first one has been wired for use with the DTL1 system. The chassis for this system is also complete. This system is due to ship to ORNL on April 18.

The efforts for programming the cavity warmup controls are also underway and still under development.

Electrical Systems Group

Front-End power supply modifications to eliminate overheating problems completed. Will start testing next week.

An additional 40 corrector power supplies have been delivered, bringing the total to date to 300 out of 360.

Testing of 30 corrector power supplies has been completed at RATS – power supplies sent to klystron gallery for installation for DTL 1 and 2 next week.

Checkout of ME2 modulator at high voltage started in earnest this week. Operation into the resistive load, including calibration of diagnostics and system integration, should be completed later today. So far, we have operated ME2 at up to 100 kV, 80 Amp, 500 us pulsewidth at 1.5 Hz. After reconfiguration of the resistive load, we expect to produce 130 kV across the load and perform the crowbar verification before reconfiguring for operation into the beamstick early next week. The RFTF modulator is now fully assembled and ready for installation after rebuilding the transformers in-house with the help of LANL representatives. The replacement transformers for ME1 are due to ship from Dynapower today, so we expect to begin that reassembly and checkout process next week as well.

Cabling started on DTL3 thermocouples. All other DTL3 cabling is complete. Ring kicker magnet cables ordered.

Cryogenics Group

CHL: Work continues on the installation of the instrument air piping. Rusty bolts have hampered the removal of the absorber vessel top cap, heavy-duty impact wrenches have been ordered and the bolts have been sprayed with lubricant. Also the outer heater conduits were damaged during shipping and are under repair. Helium leak testing of the cold box room piping is underway. Two of the first stage oil pumps have been found to be locked up. They are being removed and sent back to the manufacturer for rebuilding.

Tunnel: The #7, (of 8) 10" connection of the upstream return transfer line has been completed. Work continues on the warm gas piping, 11 stations have now been completed. The 1/4" piping from the warm gas manifolds has been left off intentionally until the rest of the installation is complete.

RATS: The return expansion can is 80% completed. All the internal piping has been installed and the shield circuit shorting straps have been attached (Picture). Installation of the shield will start this week.



Beam Diagnostics

LANL Beam Diagnostics Progress Report:

BPM pickups: 3 ea DTL BPMs with the extension tubes have been sent to ABQ for the final trimming process. This will make 8 ea. complete DTL BPMs, ready to install in drift tubes. One other DTL BPM body has been successfully checked for rf performance, and it is now ready to have the extension tubes welded on. The last (10th) DTL BPM body is in the process of having a faulty vacuum feedthrough replaced. 19 more SCL BPMs have been shipped to ORNL, leaving just 2 remaining out of 34. These BPMs will be sent after they have been mapped.

BPM electronics: We have enough PC boards to build 12 ea. AFE's, DFE's and clock multiplier chips. The DFE and clock multiplier boards have been sent to ABQ for stuffing. We expect them back next week. The PCI boards will be stuffed here at LANL. All the FPGA's for the DFE I/Q deconvolver have been burned, and work continues on the FPGA for the PCI motherboard and the small FPGA for the DFE board. Tests of the clock multiplier card continue to look good. The clock noise over a couple milliseconds of data acquisition is just 0.25 to 0.30 degrees rms, including the jitter in the electronics used to make the measurement.

WS actuators: The first article reinforcing sleeve for the joint at the base of the actuators was received, and it looks good. It was shipped to ORNL for testing on a D-plate actuator. A member of the diagnostics team presented an update on the HEBT, ring, and RTBT actuators for the design review held at BNL. Due to space constraints in the RTBT tunnel, the plan for using 18-inch actuators may not work. We are investigating to determine the available space and possible design options. We are also checking to make sure that 8-inch actuators will fit into the HEBT and ring tunnels.

WS electronics: A "design feature" of the National Instruments stepper motor driver may cause the actuator to move off its out limit when the collision avoidance system is activated. Work-arounds are being explored and tested. Parts are being ordered to fabricate 26 more wire scanner systems for the DTL, CCL, and HEBT. The signal processor PC boards will be stuffed by a vendor.

ED/FC: A possible leak has developed in the DTL-1 actuator out at ORNL. Further vacuum testing will be done at a local vacuum shop in the Oak Ridge area. The ED/FC electronics for DTL-1 and the D-plate was shipped to ORNL on 27/Mar. The remaining 5 ea. actuators for DTL-2 through 6 will go out for bid soon.

Harp: A meeting was held with LANSCE-2 to begin design work on the harp. The biggest design questions are how to mount the tungsten wires, and a determination of how hot the pads on the circuit board will get. If the pads get too hot the solder may melt.

Software: The driver software to support the various versions of the BPM PCI motherboards has passed initial testing. We are now working to add serial bus support needed for the timing card.

BNL Beam Diagnostics Progress Report:

General: BNL hosted the Diagnostics Review Committee. To quote from the opening statement of the Committee Chair at the closeout - "The Diagnostics Team is well-focused, motivated, and on track".

1.5.7.1 BPM: Baseband protected amplifier testing continues. Initial testing of low noise pre-amp indicates it is performing well. Noise < 1.5nV/rtHz, gains within a few %. Bandwidth was slightly low and needs to be refined. RF design continues. Leak checking and assembling (5) 12cm and (4) 30cm BPMs, which were received back from brazing. Finished machining parts for the additional six 30cm BPMs. Shop is inspecting the parts.

1.5.7.3 BLM: Design, construction and procurement of parts for the 8 channel test stand continues. An SNS VME chassis has been installed in our tech lab. Leakage tests were performed on the LND chambers. Results are good, less than a few pA up to 4.5KV. A second prototype end cap design has been built using cost saving features. AFE backplane and MPS interface PCB design and review continues. Work continues on the production drawings.

1.5.7.4 BCM: Testing of driver amplifier for calibrator has started. We have driven a pulse thru a PA19 amplifier and obtained slightly more than a microsecond rise time. Noise and other testing continues. Four calibrator boards for the Linac units are under construction. Additional requirements for the PC motherboards have been received from ORNL. We are investigating availability. Completed drawings for the production HEBT BCMs, working on the support design. Fabricating production HEBT units in the shop

1.5.7.5 Tune: PCI board being used for BPM system is under review for use with the tune meter.

1.5.7.6 Carbon Wire Scanner: Received (12) beam box weldments from Key High Vacuum. Completed cutting bellows to length. Welding bellows and flanges onto beam box weldments. Completed drawings for production unit. Working on support design

1.5.7.7 BIG/Tune kicker: Evaluating proposal to use tubes in the tunnel to drive the kicker

1.5.7.8 VFM: Received NI-1409 image acquisition card. We were informed that third camera for electron catcher has been added to the scope

ORNL Beam Diagnostics Progress Report:

D-plate: All actuators are installed on the D-plate and leak checked. The tank-1 FC/ED leaks. The vacuum group isolated the leak to the bellow/and its interface. We decided to send it for repair to the vacuum shop in Los Alamos. The connectivity is too complex to take the risk and attempt in fixing it at VTI. The electronics for the D-plate emittance system is ready for beam. Ernest and Andy are testing the limit switches via the EPICS system.

Anti-Chopper D-box: The design is in great shape. The prototype actuator is installed on the top plate. Stepper motor and limit switch wiring has started. Any Webster will finish that within the next few days.

Diagnostic Reference Box: Craig Deibele and Jim Pogge have made a 402.5, 2.5, 10 MHz, and 40 MHz test board. The final version of this board is a candidate to replace the Rosco box. The initial test on this board is promising. Craig meanwhile has been working with EMF Corporation to develop a Diagnostic reference box/ Master Oscillator. Craig tested this system. His conclusion is the EMF oscillators are within SNS specifications (+/- 0.1 degree of jitter).

Laser Profile Monitor: Mechanical design team is finishing up the design of the transport-line. We are on schedule to send out the design for manufacturing bid. We are procuring components for the first article laser station in FY03.

Software: Matthew is writing software for the Anti-chopper D-box test. We will use the site-wide licensed Microsoft PC Management Software for remote access to the NADs. Wim gave a talk on SNS LabView template at BNL final design review. Dave Thompson and Wim are also testing the EPICS db features and Multimaster IOCs.